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Timber: efficient and economic use

During 1973, UK imports of softwoods, hardwoods and wood products (plywood, blockboard, particle board and fibreboard), cost almost £700 million, compared with about £380 million in 1972. Import prices have continued to to rise and, despite a fall in demand during the second half of the year, the total for 1974 was in the region of £800 million. The building and construction industry used about 60 per cent of this. More than 60 per cent of the imports is softwood and about 70 per cent of this is used in building and construction.

More efficient use of timber can give better value to the user and will also help to contain or reduce the import bill. This digest outlines ways of using timber more efficiently and more economically without increasing the total cost of building or impairing functional performance.

Economic design

Refinements in grading and selection of timber now permit the design of structures with a much lower variability in performance. so that adequate safety can be obtained with greater economy of material. This is shown by the 30 per cent reduction in the amount of timber used in roofs following the introduction of prefabricated trusses, now used in 90 per cent of new housing.

Recommendations on quality of materials, permissible stresses and modification factors applicable to timber when used as simple, solid members or as parts of built-up components and structures incorporating other materials, are given in CP 112: Part 2: 1971[1]. An extensive revision of this will be published in about three years time; in the meantime, amendments are issued periodically to update the Code. BS 4978: 1973 [2] specifies the means of assessing the quality of timber for which grade stresses are given in CP 112 and its amendments.

CP 112: Part 3: 1973 [3] deals with the design, fabrication and erection of trussed rafters for roofs of dwellings, but is also applicable to other buildings where the environment or service conditions are similar.

The correct use of these Codes and Standards will ensure that timber is used efficiently in structures.

Alternative species

Whilst traditionally-used timbers have been readily available for particular applications, little thought has been given to the properties actually required of the timber. This can result in expensive over-specification if less expensive timbers, with properties adequate for the job in hand, are available.

The properties and characteristics of most of the species in current use in, or of potential importance to, the UK market are listed in the 'Handbook of hardwoods'[4] and 'Handbook of softwoods' [5]. The range of species being considered for commercial exploitation is increasing, particularly in the hardwood sector, and the maintenance and updating of information on the established, and on the less familiar, species is a continuous process at the Princes Risborough Laboratory. This bank of information is now being used in yet another way, with the object of defining the property requirements for specific end-uses of timber and providing a guide on species selection. This will help to ensure that the species selected for specific applications are the most suitable in terms of properties and cost. Publication of the end-use classification system will begin this year; in the meantime, information on species selection is available from the Princes Risborough Laboratory.

Home-grown timbers

Home-grown timber currently meets about 8 per cent of our overall national needs, but production is rising rapidly and is expected to double in the next 20 years. European redwood and whitewood and Canadian western hemlock account for some 90 per cent of the softwoods used for structural work in the U.K. Any home-grown species must therefore be judged against their performance characteristics, availability and price. For softwoods of *comparable grade*, whether home-grown or imported, there is no significant difference in performance characteristics. Therefore, if home-grown species of suitable grade can be obtained at competitive prices, they should be used. Correctly selected home-grown timber is also suitable for non-structural uses such as architraves, skirtings and battens. Some properties of the principal species of home-grown and imported softwoods are compared in Digest 72[6].

Reducing maintenance costs

Timber used in building must be dried to a moisture content appropriate to its usage and maintained in that condition throughout the construction period. Failure to do this can result in premature decay or shrinkage, distortion and splitting during the initial period of occupancy and can lead to expensive remedial work. Detailed information on the need for correct drying, and guidance on appropriate moisture content levels for various situations in buildings, are given in the 'Timber drying manual'[7].

Experience has shown that degrade of timber used in construction occurs most frequently in the external envelope of the building, particularly in door and window frames, weatherboarding and fascias. Within the building, flooring and skirtings adjacent to sinks, washbasins, etc are at greatest risk. It is estimated that 10 per cent of the imported softwood (about £50 million at 1974 prices) is used to replace timbers that have suffered decay, insect attack or mechanical damage. The major cause of degrade in new buildings is fungal decay, resulting from timber of low natural resistance becoming sufficiently moist to allow wood-destroying fungi to grow. Concise information on ways of minimising the risk of decay is given in Digests 73[8] and 110[9]. An indication of the durability of some hardwoods and softwoods is given in Technical Note 40[10].

Care in design, construction, handling and maintenance can reduce but not eliminate the risk of decay. The obvious but often too costly safeguard is to use naturally durable timber, excluding all sapwood.

Alternatively, the risk of decay can be eliminated by adequate preservative treatment. The cost of this treatment averages some 5 to 10 per cent of the cost of the timber, and in situations where there is risk of decay, the additional outlay is more than justified. Most major local authorities and the National House-Building Council now stipulate preservative treatment for all external joinery timbers. More widespread adoption of this policy and its extension to other usages in which there is risk of decay would reduce maintenance and replacement costs of timber.

Advice on the need for preservative treatment of timber in construction will be available later this year with the publication of CP 112: Part 5[11]. This will be a revision of CP 98: 1964 *Preservative treatments for constructional timber.* Details of the commercial processes and preservatives suitable for the treatment of external joinery are given in Technical Note 24[12].

Paint is the traditional finish for softwood timbers. The recommendations set out in Digest 106[13] should be followed, especially those on primer quality, in order to achieve the maximum paint life, and hence reduced maintenance costs.

In recent years there has been increasing use of exterior wood stains on softwood cladding and joinery. Wood stains provide a much thinner protective film than does paint, and most types do not obliterate the features of the timber. Their greatest attraction is that they weather by erosion and maintenance is therefore simplified. When they are used correctly, maintenance costs can be substantially reduced.

Reducing waste

Very substantial quantities of timber are wasted on building sites. A recent study[14] has shown that the average site wastage of carcassing timber is about 10 per cent, with a tendency for the wastage to be higher for the larger timber sizes. On some sites, wastage is as high as 20 per cent. Much of this is due to poor stacking and misuse and could be largely eliminated by closer site supervision. The other major cause of waste is in cutting to size and there may be advantages in organising the collection of off-cuts on site. Since there is obviously more scope for collection and utilisation of uncontaminated off-cuts within a factory, this form of waste could be reduced by more factory prefabrication. It should be remembered, however, that savings resulting from a greater degree of prefabrication can be lost through inefficient handling and storage of the manufactured units on site.

Alternative materials

Timber has, in the past, been regarded as a comparatively cheap material of construction, but the exceptionally steep rises in timber prices between 1972 and 1974 reduced the differential between timber and most of the alternative materials. During the latter part of 1974, however, timber prices levelled off and in some cases were actually reduced.

One consideration is to contain the import bill. Studies to date reveal that, at the moment, replacement of timber by other materials has little effect on the total import cost and, when processing and energy factors are taken into account, it is likely to increase the cost of building.

Recommendations

1 Ensure that specifications are concise and unambiguous, see Digest 156[15].

2 Achieve greater economy in design by using the relevant, current British Standards and Codes of Practice.

3 Reduce waste by closer site supervision and employ more factory prefabrication so that residues and offcuts can more readily be used.

4 Specify that any timber used should be dried to the correct moisture content and, where necessary, that adequate preservative treatments and painting systems are employed.

5 Specify available lower-cost alternative species when feasible.

6 Do not specify in such a way as to exclude the use of home-grown timber which may be available at a lower cost.

References

1 British Standard Code of Practice CP 112: Pt 2: 1971 (under revision) *The structural use of timber* BSI
2 British Standard BS 4978: 1973 *Timber grades for structural use* BSI
3 British Standard Code of Practice CP 112: Pt 3: 1973 *Trussed rafters for roofs of dwellings* BSI
4 *Handbook of hardwoods* (1972) HMSO
5 *Handbook of softwoods* (1957) HMSO
6 BRE Digest 72 *Home-grown softwoods for building* (1972 edition) HMSO
7 *Timber drying manual* (1974) HMSO
8 BRE Digest 73 *Prevention of decay in external joinery* (1973 edition) HMSO
9 BRE Digest 110 *Condensation* (1972 edition) HMSO
10 PRL Tech Note 40 *The natural durability classification of timber* (1974)*
11 British Standard Code of Practice CP 112: Pt 5 *Preservative treatments for constructional timber* (not yet published) BSI
12 PRL Tech Note 24 *Preservative treatments for external joinery timbers* (under revision)*
13 BRE Digest 106 *Painting woodwork* (1974 edition) HMSO
14 Current Paper CP 44 *Wastage of materials on building sites* (1974)*
15 BRE Digest 156 *Specifying timber* (1973) HMSO

**Free on request from Distribution Unit, Building Research Establishment, Garston, Watford WD2 7JR (a change may be made for supplies in quantity)*

Further information

PRL Tech Note 38 *The movement of timbers* (1973)*
PRL Tech Note 44 *Decay in buildings — recognition, prevention and cure**
PRL Tech Note 46 *The moisture content of timber in use* (1970)*
Joinery (1971) HMSO
Decay of timber and its prevention (1969) HMSO
British Standard BS 1186: 1971 *Quality of timber and workmanship in joinery* BSI
British Standard BS 4471: 1969/1971 *Dimensions for softwood* BSI

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